

# Long COVID: A Costly Condition Imposing Substantial Burden on Society

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## INTRODUCTION

- Long COVID describes a broad array of persistent or newly occurring symptoms that are present weeks or months beyond acute illness with COVID-19.<sup>1</sup> Symptoms include but are not limited to fatigue, shortness of breath, chest pain, loss of smell and cognitive impairment.<sup>1</sup>
- Prevalence estimates for long COVID are influenced by several factors, including the severity of acute COVID-19. Studies of patients who were hospitalised with acute COVID-19 report a pooled prevalence of 47%, while studies comprised mainly of non-hospitalised patients estimate a pooled prevalence of 26%.<sup>2</sup> The prevalence of long COVID is higher still among patients who required treatment in an intensive care unit (74%).<sup>3</sup>
- Despite the burdensome symptoms, little is known about the impact of long COVID on productivity, employment and healthcare resource utilisation (HCRU). Given the high global prevalence of long COVID, there is potential for widespread economic burden.

## OBJECTIVE

- To perform a structured targeted literature review (TLR) that identifies and summarises studies on the economic impact of long COVID, in terms of HCRU and associated costs, productivity losses and broader societal impact.

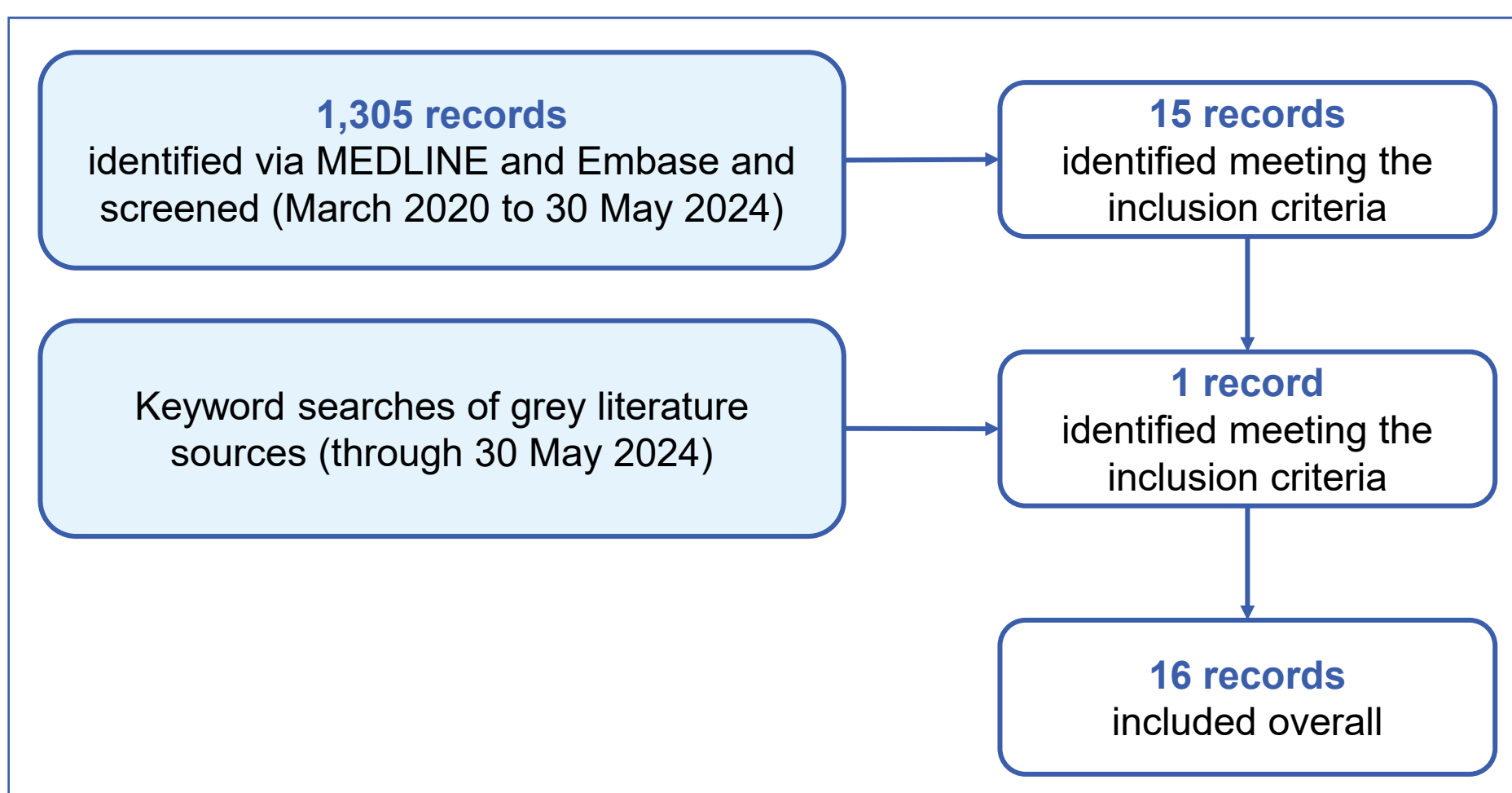
## METHODS

- Comprehensive database searches were conducted in Embase and MEDLINE on May 30, 2024, to identify studies of individuals with prior acute COVID-19 that were published since March 2020—the beginning of the pandemic.
- Additional targeted searches of grey literature sources (e.g., government, charity and other key organisation websites) were conducted in May 2024.
- Observational studies and meta-analyses of observational studies evaluating the impact of long COVID on employment, absenteeism, productivity, HCRU and associated costs were eligible for inclusion.

## RESULTS

- A total of 16 studies were included in the TLR—15 observational studies, and one meta-analysis (**Figure 1**).
  - The studies were conducted primarily in Europe (n=9) or North America (n=5), with a single Asian and global study also included (**Figure 2**).
  - Across studies, patient follow-up ranged from 2 months to >2 years post-acute infection.

Figure 1. Study Selection Process

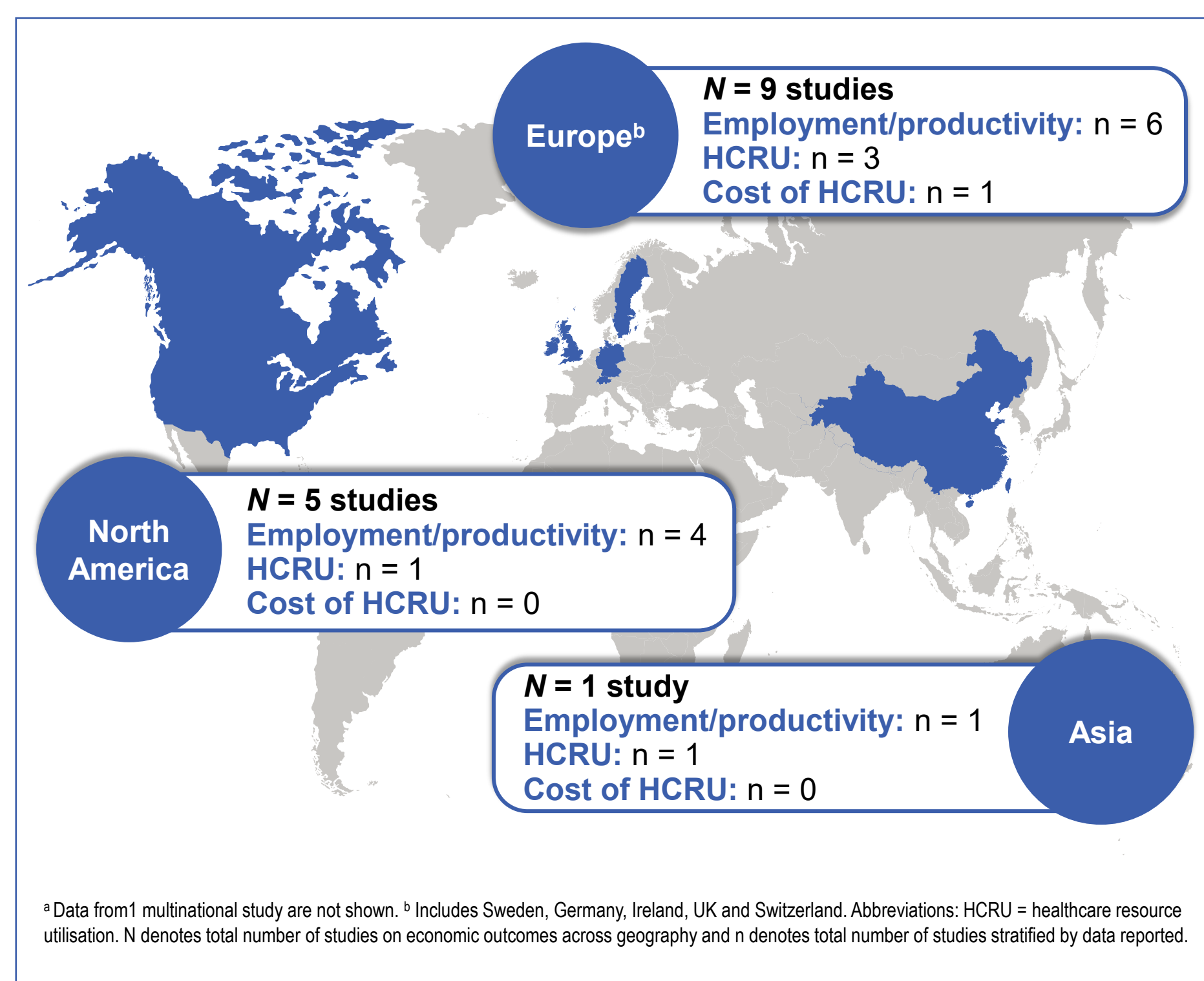


- Of the 16 studies, 11 assessed the impacts of long COVID on work productivity.
  - The proportion of patients with long COVID with impaired work productivity ranged from 8% to 40% and varied by geographical region and follow-up time (**Figure 3**).
  - A meta-analysis of data from four studies conducted in China (n=2), France (n=1) and the United States ([US], n=1), representing 259 persons impacted by long COVID, found that approximately 20% of individuals had impaired work ability, or had not returned to work over a median follow-up of 3.4 months.<sup>4</sup>
  - In China, 11% of individuals (n=56/494) had not returned to work after 2 years of follow-up since acute COVID-19.<sup>5</sup>

## RESULTS (continued)

- In the US, individuals with long COVID (n=94) had not returned to pre-COVID-19 productivity levels at 6 months follow-up, and had greater work productivity losses vs. individuals without long COVID\* (mean Work Productivity and Activity Impairment scores of 26.0 vs. 7.5, respectively, at 6 months; p<0.001).<sup>6</sup>
- In Germany, estimated national productivity losses due to long COVID, based on a 12-week period of absenteeism, exceeded €5.9 billion.<sup>7</sup>

Figure 2. Studies and Outcomes of Interest by Geography<sup>a</sup>



- Five of the 16 studies assessed impacts of long COVID on HCRU (**Table 1**).
  - In the United Kingdom (UK), individuals managed for acute COVID-19 in a community or hospital setting had higher HCRU (primary care visits, hospital admissions, emergency department visits) at 3.5- and 2.2-months follow-up, respectively, vs. the 12 months before infection (p<0.001).<sup>8</sup>
  - In Switzerland, incomplete COVID-19 recovery was associated with HCRU (primary care visits, hospital readmissions) at 6- to 8-months follow-up.<sup>9</sup>
  - In Germany, HCRU costs associated with long COVID during 2021 were estimated to total €332 million.<sup>7</sup>

Table 1. Impacts of Long COVID on HCRU

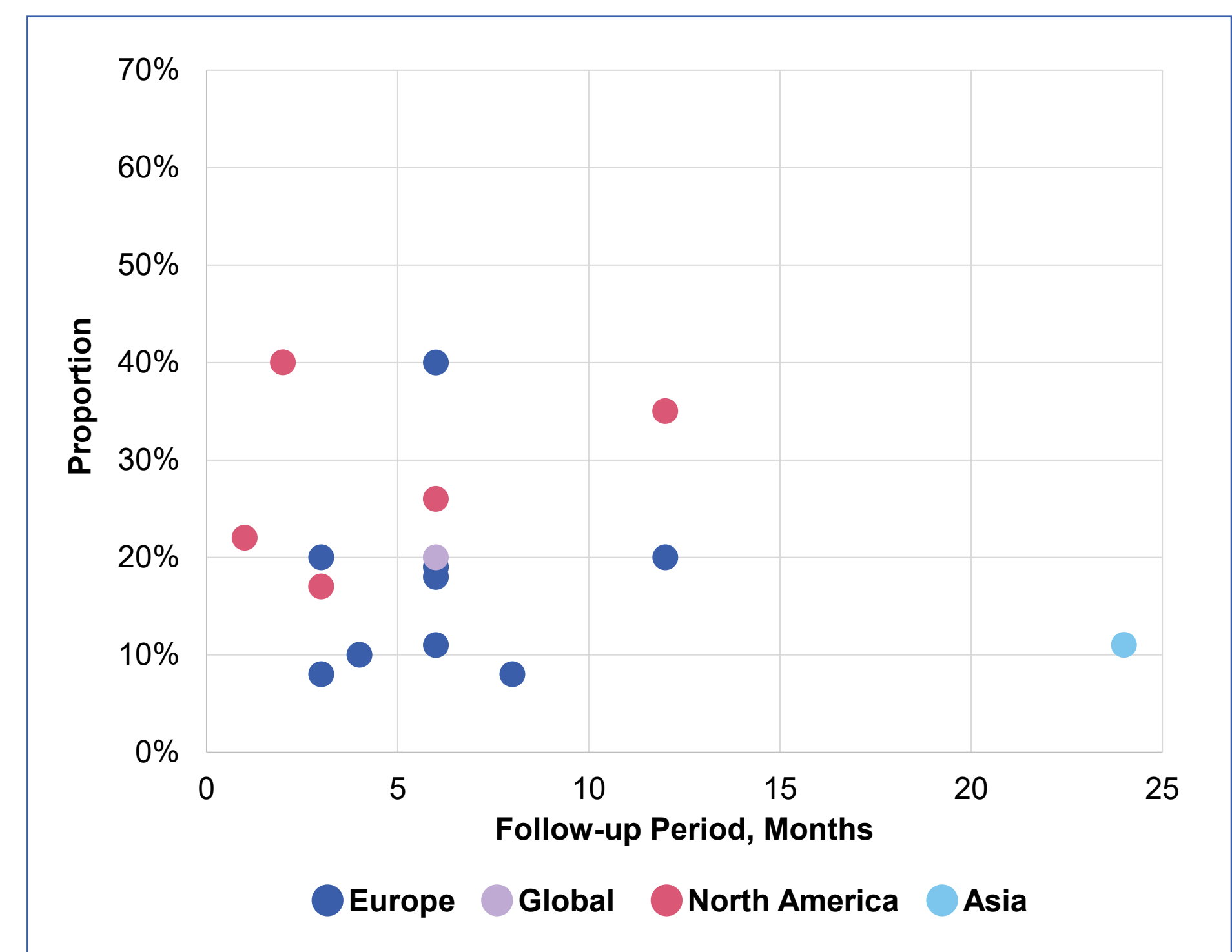
Author, Year	Patient Description	Sample Size	HCRU
Europe			
Heeney et al. 2023 <sup>10</sup>	Patients with prior acute COVID-19 in Ireland, presenting to a post-COVID-19 clinic	311	Approximately 27% of patients required further referrals, at a median of 3 months follow-up following initial diagnosis: <ul style="list-style-type: none"><li>Respiratory: 12%</li><li>Cardiology: 4%</li><li>Physiotherapy: 5%</li><li>Psychology: 4%</li><li>Neurology: 1%</li></ul>
Menges et al. 2021 <sup>9</sup>	Patients previously hospitalised with acute COVID-19 in Switzerland	81	Approximately 10% required at least one rehospitalisation due to COVID-19-related complications in the post-acute period
Whittaker et al. 2021 <sup>8</sup>	Patients with prior acute COVID-19 in the UK	456,002	Following the acute period, total HCRU events were 8,057 per 100,000 per week—an increase of 18% compared to the pre-COVID-19 period
North America			
McNaughton et al. 2022 <sup>11</sup>	Community-dwelling adults in Canada with previous positive PCR test at risk of long COVID	265,851	Mean total healthcare encounter rate difference per person per year, ≥56 days following positive test (vs. negative test): <ul style="list-style-type: none"><li>Males: 0.66</li><li>Females: 1.98</li></ul>
Asia			
Huang et al. 2022 <sup>5</sup>	Survivors of COVID-19 in China, 2 years following hospitalisation	1,192	Participants with long COVID symptoms had a higher risk of rehospitalisation (OR: 1.64; 95% CI: 1.12, 2.41) or outpatient visits (OR: 2.82; 95% CI: 1.99, 4.00), compared to patients without long COVID

Abbreviations: CI = confidence interval; HCRU = healthcare resource utilisation; OR = odds ratio; PCR = polymerase chain reaction

\*Individuals without long COVID who had prior confirmed acute COVID-19.

## RESULTS (continued)

Figure 3. Proportion of Individuals with Work Productivity Impairment vs. Timepoint of Evaluation



## LIMITATIONS

- The economic impact of long COVID is substantial and varied across the included studies.
- The studies mostly rely on self-reported symptoms and work impairment, with some studies lacking comparisons to pre-pandemic work status.
- Variable definitions of work productivity impairment were used across studies.
- With one exception,<sup>7</sup> no studies reported on the economic cost of HCRU associated with long COVID.
- Studies used different follow-up periods post-acute COVID-19, reflecting poor global consensus on a definition for long COVID.
- The severity of acute COVID-19 across study populations is variable and could influence the severity of long COVID being assessed.
- The impact of different circulating variants on long COVID has not been assessed.

## CONCLUSIONS

- Long COVID results in absenteeism, unemployment and widespread economic burden via reduced productivity and increased HCRU.
- Future research should monitor the impact of long COVID following acute infections—especially those caused by circulating variants.

## References

- WHO. Coronavirus disease (COVID-19): Post COVID-19 condition. Accessed 20 Sep, 2024
- Woodrow M, et al. *Open Forum Infect Dis*. 2023;10(7):ofad233.
- ECDC. Prevalence of post COVID-19 condition symptoms: A systematic review and meta-analysis of cohort study data stratified by recruitment setting. 2022.
- Sanchez-Ramirez DC, et al. *Biomedicine*. 2021;9(8):900.
- Huang L, et al. *Lancet Respir Med*. 2022;10(9):863-876.
- Di Fusco M, et al. *Healthcare (Basel)*. 2023;11(20):2790.
- Gandjour A. *BMC Health Serv Res*. 2023;23(1):641.
- Whittaker HR, et al. *BMJ*. 2021;375:e065834.
- Menges D, et al. *PLoS One*. 2021;16(7):e0254523.
- Heeney A, et al. *PLoS One*. 2023;18(8):e0289245.
- McNaughton CD, et al. *CMAJ*. 2022;194(40):E1368-e1376.

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## Disclosures

This study was conducted as a collaboration between Evidera, a business unit of PPD, part of Thermo Fisher Scientific. Pfizer is the study sponsor.

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